STATE OF CALIFORNIA -- THE RESOURCES AGENCY **GRAY DAVIS,** *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

March 27, 2003

Ms. Lynn Barris
2830 House Avenue
Durham, California 95938

Dear Ms. Barris:

Thank you for your comments of October 31, 2002, on the Draft State Water Project Delivery Reliability Report. We welcome the interest this draft report has generated and are pleased to provide a response to your questions and concerns.

You request three areas be addressed to improve the information in the report. They are a discussion of the potential impact of senior and Area-of-Origin water rights upon the delivery estimates of the State Water Project; additional analysis of the factors affecting historical deliveries and their impact upon projected deliveries with an emphasis upon a "worst case" scenario; and an assessment of other potential conditions that could affect SWP deliveries in the future.

Most of the water rights that could affect the SWP are subject to settlement agreements where the rights and obligations of users in relationship to the SWP are quantified and fixed. Riparian uses are inherently limited both by the ratcheting downwards of the area under riparian ownership under the source-of-title doctrine and by the doctrinal limitation of riparian rights to non-municipal uses or to uses which do not require seasonal storage. Hence, riparian rights, in the aggregate will never get materially larger and will likely only get smaller.

Claims under Area-of-Origin water rights are expected to require new storage facilities, for which local beneficiaries have been reluctant to pay. A reduction of supply available to the SWP due to area-of-origin claims is possible and the Department of Water Resources will continue to monitor the status of upstream water use to assess the reasonability of the delivery reliability forecasts. Possible changes in assumed future conditions will be explored by a sensitivity analyses to be conducted on CALSIM II.

The sensitivity analysis is part of an effort undertaken by DWR to evaluate the adequacy of the studies being used for the reliability estimates. In addition to the sensitivity analysis, the evaluation consists of a simulation of a recent drought period and a longer historic period to evaluate how well CALSIM II simulates the operation of the SWP, and a peer review conducted by the CALFED Science Program on the suitability of using CALSIM II for estimating SWP delivery capability.

Attachment 1 describes the study and results of the comparison of CALSIM II results with actual SWP deliveries for the most recent drought period (1987-1992). Attachment 2 describes the historical project operations study. The sensitivity analysis and peer review are expected within a year.

The report presents information on the estimated delivery ability of the SWP under a range of historic hydrologic conditions. It is not designed to present a "best" or "worst" case with respect potential future occurrences but a reasonable estimate of SWP delivery ability. As you know, to overestimate the delivery ability of the SWP could lead local areas receiving water from the SWP into a false sense of security that water will be available to support additional uses in their area. To underestimate the delivery ability could lead to unnecessary or premature construction of water supply facilities. The report presents the best information currently available.

DWR plans to finalize the SWP Delivery Reliability Report in the near future. We recognize that this is an ongoing process and plan to revise the report frequently. We commit to involving the public in the discussions and analyses regarding the sufficiency of CALSIM II. In addition, we encourage the exploration of alternative methods of evaluating SWP delivery ability or different ways of using CALSIM II for this evaluation. DWR is committed to working with all interested parties and the Modeling Work Group of the California Water Plan Update 2003 with the expectation that the next report will be improved and have greater support.

Your letter, as well as all others, commenting on the draft report and the corresponding responses will be included in an appendix to the final report. In addition, they are posted on the State Water Project Delivery Reliability Report website (http://swpdelivery.water.ca.gov).

Thank you for your comments. If you wish to discuss the report further or would like more information on the CALSIM II evaluation, please call me at (916) 653-1099. For technical information, please contact Francis Chung, Chief of DWR's Bay-Delta Office Modeling Support Branch, at (916) 653-5924.

Sincerely,

Katherine F. Kelly

Katherine F. Kelly, Chief
Bay-Delta Office

Attachments

Comparison of Historical and CALSIM II Deliveries for 1987-1992

As explained on page 6 of the draft report, past deliveries cannot accurately predict future deliveries. There have been continual, significant changes in the factors that determine State Water Project water delivery, including water demand. SWP Water contractors' requests for water have increased in recent years and 2001 is the first year that requests exceeded 4.0 million acre-feet per year (as shown in the attached Figure 1).

The 2001 model study used for the draft report assumes that current water-use conditions, including water demands, exist for each year analyzed in the 73-year model study. Since the 2001 model study includes water demands that are significantly higher than historical levels, modeled water deliveries often exceed historical deliveries. One exception to this would be during dry periods because supply, not demand, determines the amount of water delivery.

Historical values for SWP Table A deliveries from the Delta have been compared to the Table A delivery values of the 2001 model study for the dry period of 1987 through 1992 to assess how well CALSIM II simulates supply-limited conditions for a recent period. This comparison requires three adjustments to be made for the results to be comparable. One adjustment is made to the historical delivery data and two are made to the conditions assumed for CALSIM II.

The historical delivery data are adjusted to be comparable to the model results as follows. Historically, a portion of the annual water allocation is carried over in SWP storage facilities and delivered in the following year. The CALSIM II model does not currently have criteria and procedures to allow carryover of allocated water from one year to the next. To make the historical data comparable to model data, the historical Table A delivery data was adjusted to show all the "carryover water" being delivered in the year of allocation rather than the following year. The adjusted historical and 2001 model study deliveries for the 1987 through 1992 dry period are compared in Figure 2.

The modeled average delivery for this period is 1,670 taf/yr compared to the historical average of 2,030 taf/yr in CALSIM II format.

The two adjustments made to CALSIM II are 1) changing the regulatory requirements for Delta operation to match the ones in place during 1987-92, and 2) adjusting the reservoir storages at the beginning of the period to match those that actually existed at that time.

The 2001 model study in the draft report includes regulatory constraints that were not applicable to the 1987-1992 period (State Water Resources Control Board Decision 1641). For comparison purposes, a special 2001 model study was completed with the regulations that were in effect at that time (Decision 1485). As shown in Figure 3, this study produces higher SWP deliveries than the original study with the D-1641

constraints. The study's modeled average delivery for this period is 1,910 taf/yr, compared to the average of 1,670 taf/yr for the original study. A comparison of the revised study results with the historical deliveries is shown as Figure 3.

Modeled SWP demand for 1986, a wet year just before the dry period, is 3,345 taf compared to the historical request of 2,364 taf. As a result of this higher model demand, modeled SWP storage at the beginning of the dry period is approximately 420 taf lower than the historical SWP storage. The modeled storage at the end of the dry period is essentially the same as the historical value. There is, therefore, an additional 420 taf of supply that would have been delivered in the model and the CALSIM delivery amounts during the dry period should be adjusted accordingly. To adjust for the 420 taf difference in storage, 70 taf was added to the modeled delivery for each of the six years in the dry period. This adjustment raises the average model delivery for the dry period to 1,980 taf/yr, 50 taf/yr lower than the historical average of 2030 taf/yr (Figure 4).

Figure 1
SWP Contractor's Table A Request versus 2001 Model Study SWP Table A Demand

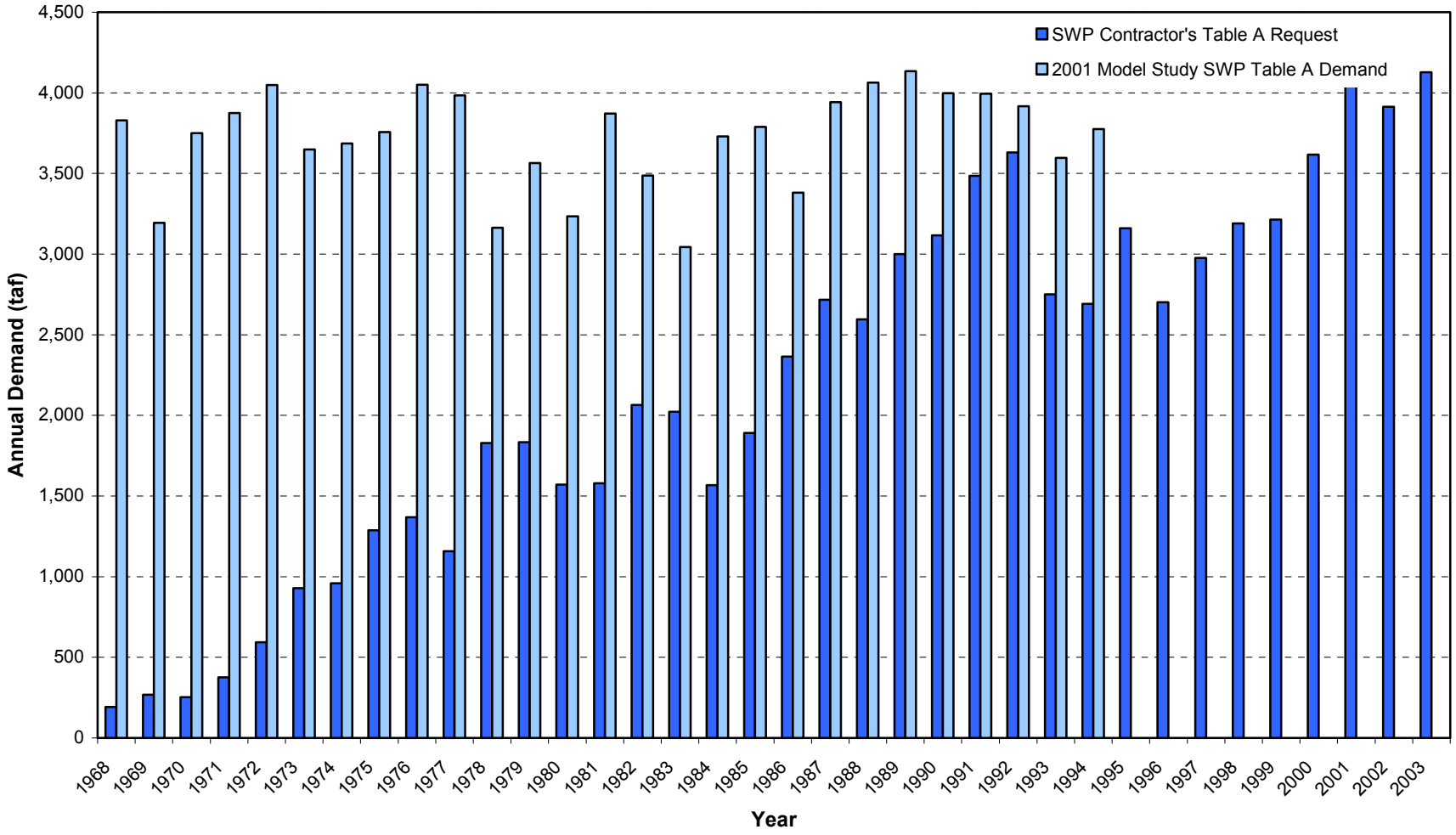


Figure 2
Historical SWP Table A Delivery versus 2001 Model Study SWP Table A Delivery
1987 - 1992 Dry Period

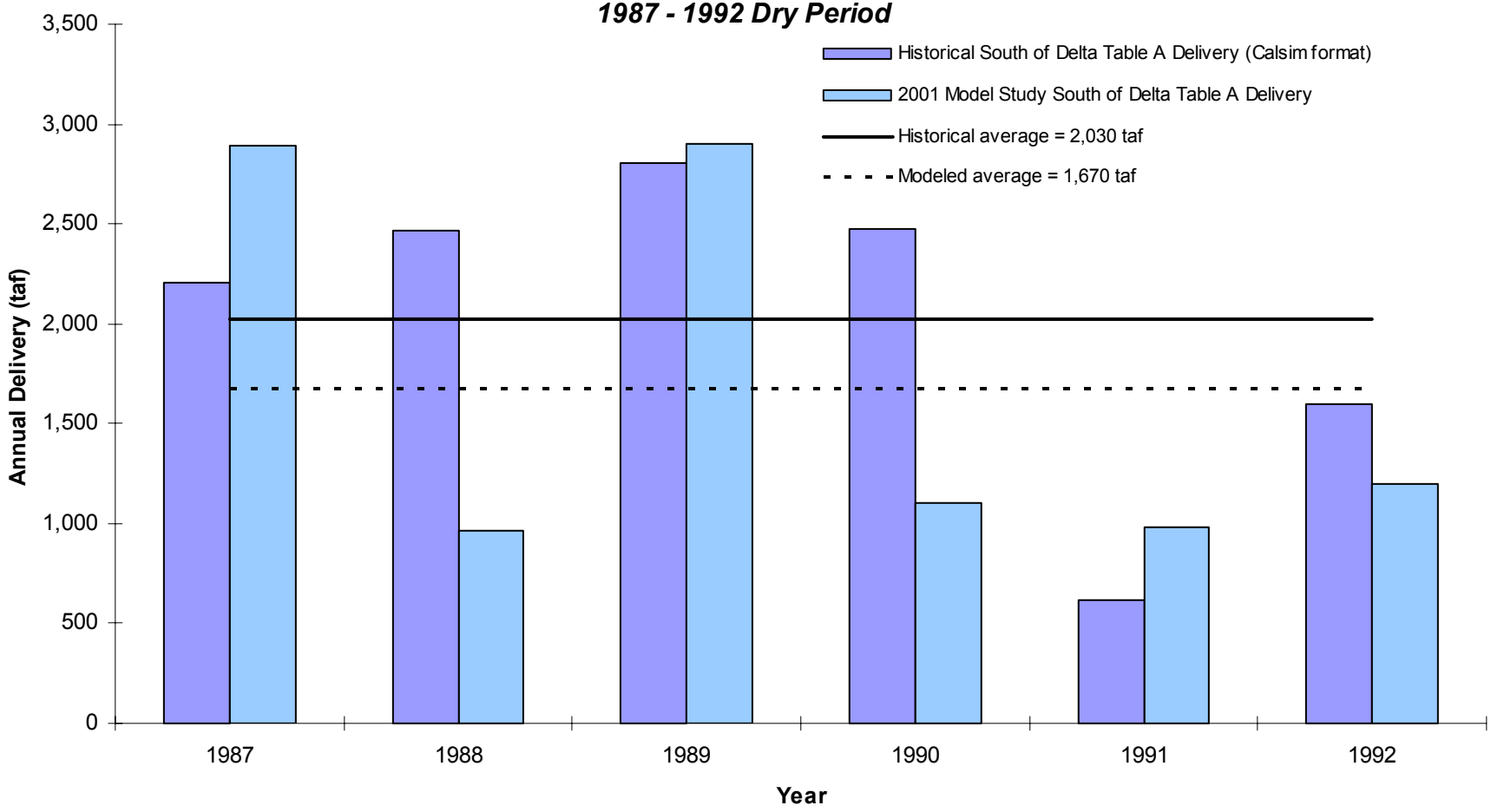


Figure 3
Historical SWP Table A Delivery versus 2001 D-1485 Model Study SWP Table A Delivery
1987 - 1992 Dry Period

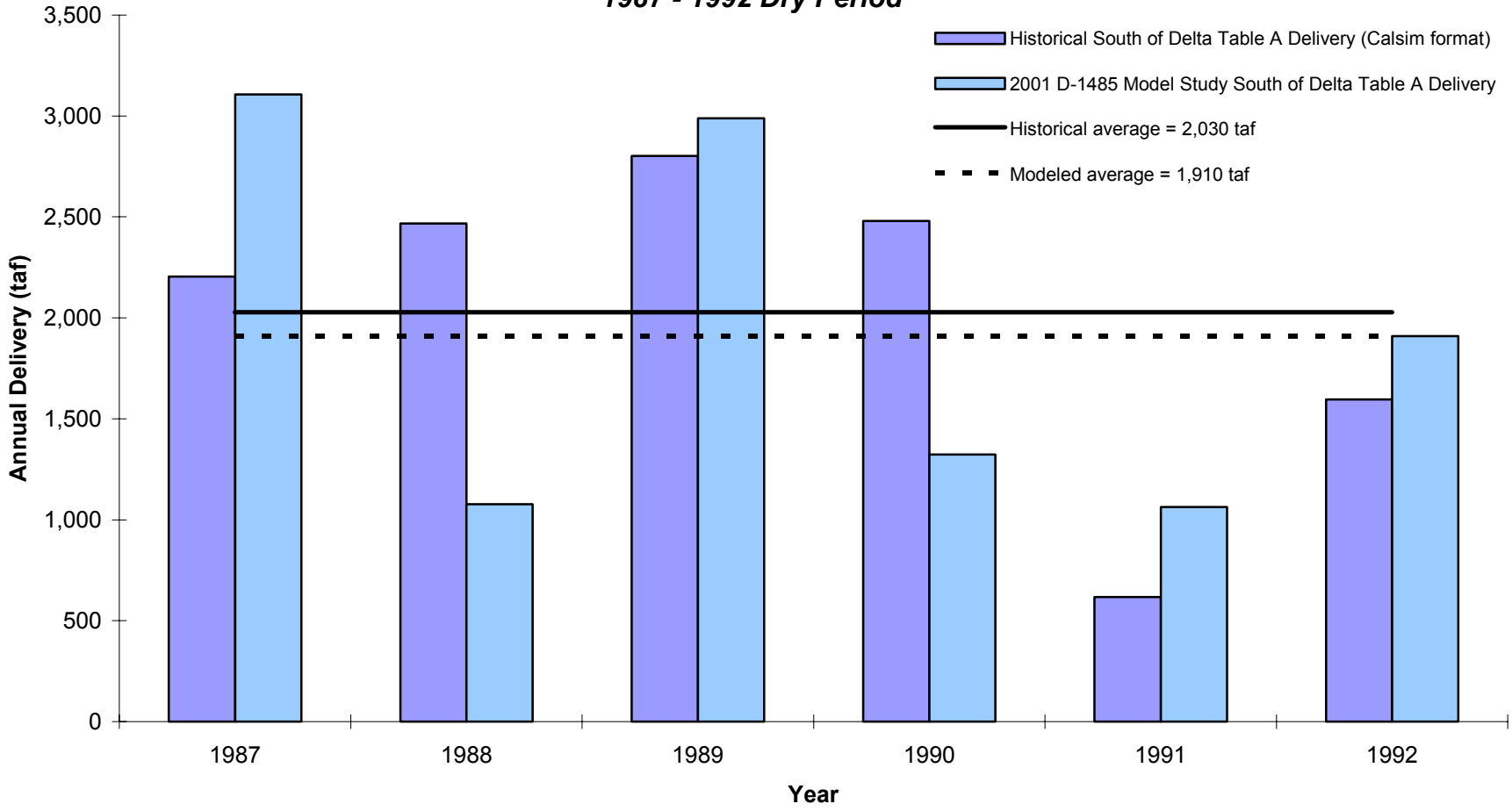
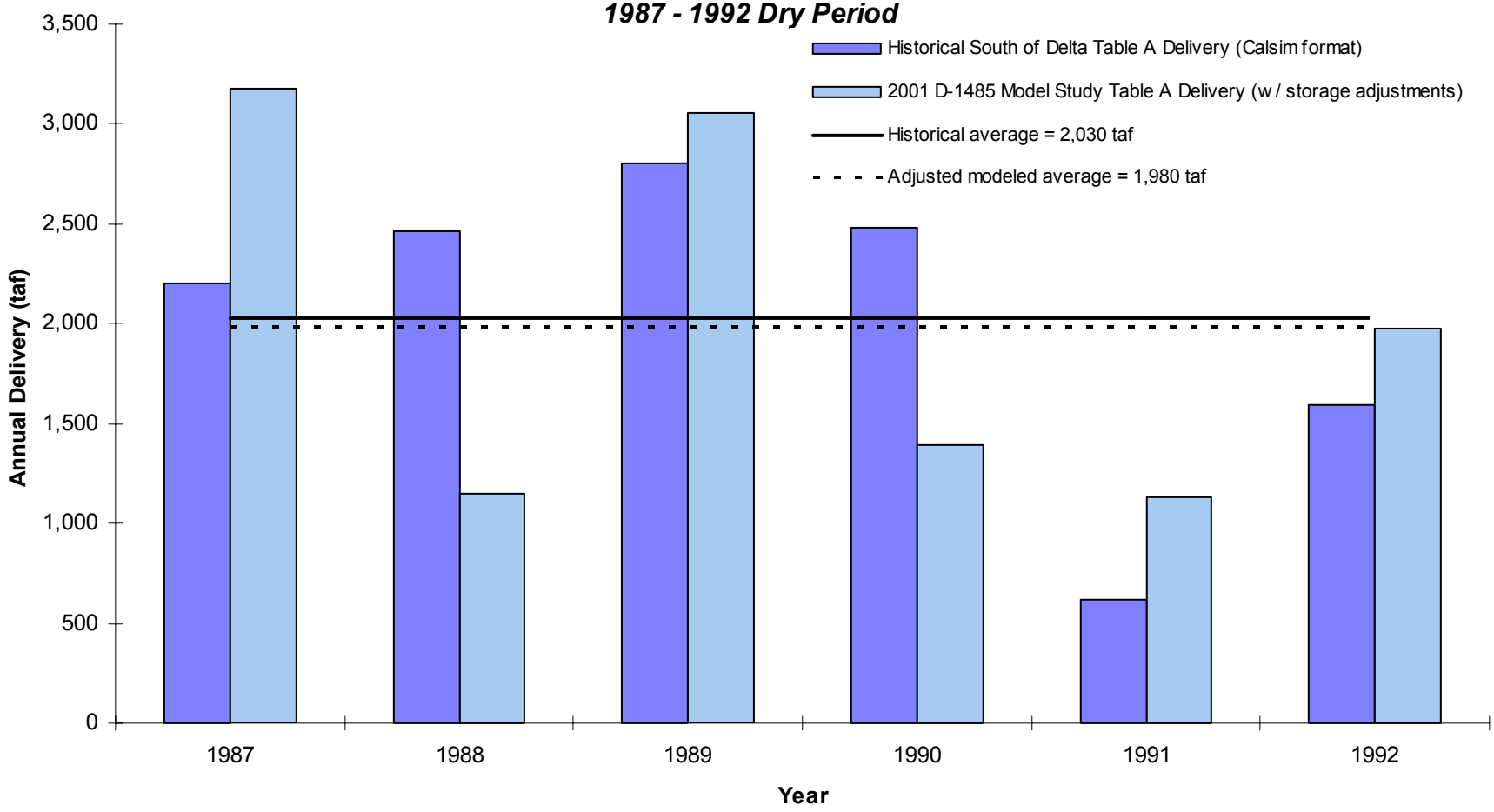


Figure 4
Historical SWP Table A Delivery v. Adjusted 2001 D-1485 Model Study SWP Table A Delivery
1987 - 1992 Dry Period



CALSIM II Evaluation

DWR's Bay-Delta Office is currently undertaking a "historical project operations study" to investigate the accuracy of the model's water supply estimates. The purpose of the historical project operations study is to compare CALSIM II results with historical operations and investigate the source of any differences in historical and simulated performance. The historical project operations studies is part of a larger CALSIM II evaluation process. Other components of this evaluation will include a survey of stakeholders; a model peer review by leading academics and practitioners; and a sensitivity analysis on model inputs and parameters. Initial results from the historical project operations study are expected to be available by March 2003.

The historical project operations study, conducted by DWR, will compare CALSIM II model results to recent historical operations for water years 1975 to 1998. This 24-year period includes both the 1976-77 and 1987-92 droughts. It also includes water year 1998 that is one of two years for which detailed analysis of historical water supply and demand is being conducted as part of the California Water Plan Update 2003 (Bulletin 160-03).

For the historical project operations study, input to the current CALSIM II model will be changed to reflect historical conditions. The inflow hydrology will be revised to reflect historical rather than current or projected level of development. Demand will be calculated for the historical land use, based on DWR's land surveys and county commissioners' reports, rather than a fixed level of development. Project contracts and entitlements will be changed to their historical level. Lastly operation logic will be changed to reflect the changing regulatory base line such as the release of the State Water Resources Control Board 1995 Water Quality Control Plan and State and federal biological opinions for Delta smelt and Chinook salmon.

The study will be limited in geographical scope to a dynamic operation of the Sacramento Valley, the Delta, and CVP-SWP facilities south of the Delta. Delta inflows from the San Joaquin Valley and the East Side Streams will be fixed at their historical level. In dry years when the system is system is supply limited, the SWP target demands will be set equal to the historical requests. In wet years when the system is demand driven, target demands will be set equal to historical deliveries. Similarly for the CVP, historical requests or annual contract amounts will be an upper bound on CVP deliveries.

Modeling of the CVP-SWP system and areas contributory to the Sacramento-San Joaquin Delta requires considerable input data. The majority of the data relates to either system inflows or demand data for the 73-year period of simulation. As described in page 7 of the report, DWR has committed to undertake a sensitivity analysis on SWP water delivery reliability. This analysis would examine the effects of certain assumptions, parameters and input data on model results. The aim of the sensitivity analysis is to identify the input data that most strongly affect model results so that future

work within the Department can be focused on refining estimates of these key determinants.

The current representation of groundwater in CALSIM II is only a first step towards developing a fully integrated groundwater surface water model. The Department is currently developing the Central Valley Groundwater Surface water Model with the eventual aim of linking this model to CALSIM II to study impacts of surface water operations, groundwater pumping and land use change on groundwater elevations. The current groundwater model component of CALSIM II affects surface water operations through the calculation of the stream-groundwater interaction. There is considerable uncertainty about the magnitude of this interaction. In areas with high groundwater levels, groundwater inflow to streams is a function of groundwater head. In areas of low groundwater elevation where stream seepage flows to the groundwater, there is an assumed hydraulic disconnect between the stream and the aquifer so that seepage is independent of groundwater elevation. It is acknowledged that groundwater elevations are not accurately modeled in CALSIM II. As calculated by CALSIM II, groundwater inflows to the stream system in the upper Sacramento Valley average 255 taf/yr. Stream losses to groundwater in the lower Sacramento Valley average 40 taf/yr. This compares with an average annual Sacramento River inflow to the Delta (at Freeport) of approximately 16 maf/yr.

In any discussion on model “calibration” it is important to remember that CALSIM II is a mass-balance accounting model and ***not*** a distributed hydrologic model that simulates a physical process. It is also important to understand that the hydrology development is based on historical gage data. Valley floor accretions and depletions are calculated as closure terms in a hydrologic mass balance calculated for each Depletion Study Area. The accretions represent local ungaged runoff into the stream system and are calculated based on gage data for stream inflows and outflows across the hydrologic boundary and estimates of urban and agricultural consumptive use of applied water within the region. The accretions and depletions also contain all the errors in the mass balance stemming from poor gage data or incorrect estimates of groundwater extraction or agricultural and urban water use. True calibration techniques can only be applied to a few components of the CALSIM II model, such as the Artificial Neural Network used for determining flow-salinity relationships in the Delta and the multi cell groundwater model.